5.7 SWMU 9: OLD AREA 2 (INCLUDING MUSTARD HOLDING AND PIT AREAS)

5.7.1 Site Description and Waste Generation

SWMU 9 includes the open storage part of the Area 2 chemical munitions safeguarding area and Old Area 2 located to the southwest of Area 2, which is identified as Site 27 in the EPIC (1982) study (Figure 5.7-1). According to the Installation Assessment (USATHAMA 1979), Area 2 was used to store munitions containing mustard, possibly V and VX, chemical agent identification sets, and war gas identification sets. Weston (1991) described Area 2 as 23 chemical ammunition storage buildings and an open area where 1-ton containers of mustard, GB, and VX were stored on rails. This open storage is included in SWMU 9.

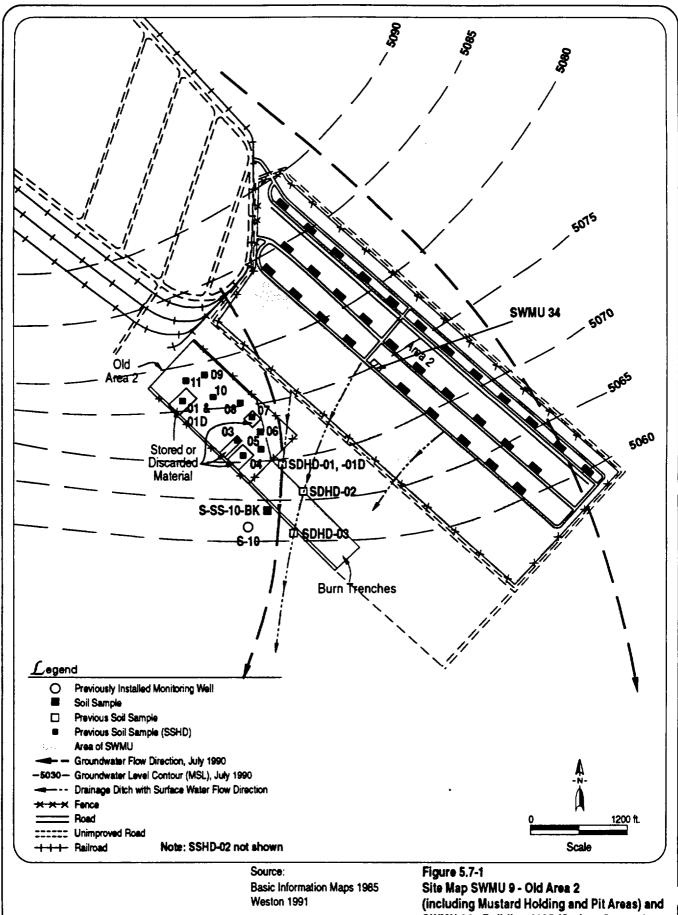
Old Area 2 is located southwest of Area 2 and was allegedly used to store M70 bombs, mustard, chemical agent identification sets, and a limited number of 1-ton containers of mustard and lewisite. EPIC (1982) described Site 27 (Old Area 2) in 1974 as a storage or disposal area consisting of many shallow trenches or linear, revetted storage sites with storage racks and small containers or objects. Possible agent canisters were present in four separate locations at the site. Trenches are also present to the east of the fenced portion of Old Area 2 in the 1974 airphoto. By 1981, some of the stored or discarded objects had been removed. By 1986, all of the stored containers had been removed. Presently, SWMU 9 is not used for open storage of any kind.

The Installation Assessment (USATHAMA 1979) stated that surveillance testing of CK, and CG occurred at Old Area 2; however, this testing involved only sampling the CK filled bombs and sending the samples to the chemical laboratory at Building 541, and the CG bombs were typically checked for leaks. Old Area 2 reportedly contained leaking H munitions (USATHAMA 1979) that were disposed of by burning. Weston (1991) identified the trenches to the east of Gld Area 2 as burn trenches; however, it is not known if the leaking mustard munitions were burned in these trenches or at another location. The locations where leaks occurred were decontaminated with bleach and plowed into the earth. The locations of these areas are not documented. The area was fenced and toxic chemical warning signs were posted on the fence (USATHAMA 1979). Ertec (1982) indicates that GB, incendiary powder, and WP were stored at the former mustard holding area within SWMU 9, but it is unclear whether this area is part of Old Area 2 or Area 2. Also, the Installation Assessment (USATHAMA 1979) reports a VX spill in the southeast corner of former Storage Area 2 (Area 2), but the exact location of this area is unknown because the extent of the site appears to be differently defined in each previous study.

5.7.2 Site Hydrogeology

SWMU 9 is located on a southwest-sloping topographic surface and is underlain by Quaternary alluvial deposits. The subsurface lithology at this SWMU was extrapolated from the closest monitoring well (S-10).

The near-surface sediment is composed of loose, light, yellowish-gray, organically rich (e.g., roots and rootlets), clay and silty sand with a trace of gravel (CL, SW). The unsaturated zone is approximately 65 ft thick and is composed of light brown to gray, sandy gravel (GP, GM) with



SWMU 34 - Building 4105 (Carbon Storage)

Tooele Army Depot - South Area

Prepared by: Ebasco Services Incorporated

some sandy clay (CL) interbeds. The saturated zone was logged from approximately 70 to 90 ft and is composed of pale brown, sandy clay (CL). The depth to groundwater, estimated from the July 1990 potentiometric surface map (Plate 3), is 70 ft below ground surface. The groundwater elevation at SWMU 9 is approximately 5,080 ft msl. Groundwater flows southeast to south from this SWMU.

5.7.3 Previous Sampling and RFI-Phase I Sampling Results

Previous sampling of SWMU 9 included the collection of soil samples from Old Area 2, sediment samples from drainages, and groundwater samples from monitoring well S-10.

Groundwater samples previously collected from well S-10 were analyzed for semivolatile organics, agent breakdown products, metals, anions, and radiological parameters. This well was resampled during the RFI-Phase I and analyzed for the full suite of analytes listed in Table 3.10-3, Section 3.10.10.

Previously collected soil and sediment samples from SWMU 9 included 11 from the mustard spill area in Old Area 2 and three from drainages southeast of Old Area 2. The spill area soil samples were collected from 1 to 3 ft, and the stream sediment samples were collected at a depth of 1 to 1.5 ft. These samples were analyzed for metals, semivolatile organics, and agent breakdown products. During the RFI-Phase I, one background soil sample was collected near well S-10. Table 5.7-1 lists the previous detections in soil, sediment, and groundwater samples for SWMU 9. Table 5.7-2 summarizes the RFI-Phase I groundwater detections and metals in the background soil sample. Historical and RFI-Phase I sampling locations, detected compounds, and their concentrations are presented in Figure 5.7-2 through 5.7-5.

5.7.4 Contamination Assessment

Benzyl alcohol and IMPA were previously detected in well S-10 at low concentrations, and phthalates were detected in this well at high levels. No organic compounds were identified at well S-10 during the RFI-Phase I. The RFI-Phase I detection limits for IMPA were lower than previous investigations, and the previous data for this compound were qualified as noncertified by USATHAMA, casting doubt on its accuracy.

Well S-10 is included in water quality zone I. Several metals were previously measured at elevated concentrations in well S-10, but none of these high levels were repeated in the RFI-Phase I.

No organic compounds were detected in soil samples collected from Old Area 2 during previous investigations. However, chromium, copper, and nickel exceeded background soil concentrations established during the RFI-Phase I. The single detection of silver at SSHD-10 was only slightly elevated above the background concentration.

SOIL $(\mu g/g)$

	SSHD-01	SSHD-01D	SSHD-02	SSHD-03	SSHD-04	SSHD-05	SSHD-06	SSHD-07	SSHD-08
Analytical Groups and Analytes Detected	(1-3 ft) 1988								
Semivolatile Organics:	NA								
Bis (2-ethylhexyl) phthalate									
(В2ЕНР)									
Benzyl alcohol (BZALC)	i I								
Butylbenzyl phthalate (BBZP)									
Unknowns ^c	<u> </u> 								İ
Agent Breakdown Products:	<u> </u>								!
Isopropylmethyl phosphonic acid	NA								
(IMPA)	<u> </u>								
Metals:	<u> </u>								
Arsenic (As)	LT (5.7)	LT (5.7)	LT (5.7)	LT (5.7)	13/LT (5.7)	LT (5.7)	LT (5.7)	6.4 (5.7)	LT (5.7)
Barium (Ba)	LT (u)								
Beryllium (Be)	LT (0.33)	LT (0.33)	LT (0.33)	LT (0.33)	0.34/LT (0.33)	LT (0.33)	0.30 (0.33)	LT (0.33)	0.32 (0.33)
Cadmium (Cd)	4.1 (0.70)	LT (0.70)	1.4 (0.70)	LT (0.70)	LT (0.70)	1.1 (0.70)	LT (0.70)	2.2 (0.70)	LT (0.70)
Chromium (Cr)	230 (2.5)	240 (2.5)	160 (2.5)	160 (2.5)	250/150 (2.5)	230 (2.5)	210 (2.5)	230 (2.5)	210 (2.5)
Copper (Cu)	21 (3.8)	75 (3.8)	100 (3.8)	58 (3.8)	61/120 (3.8)	100 (3.8)	110 (3.8)	95 (3.8)	110 (3.8)
Lead (Pb)	18 (4.8)	12 (4.8)	8.6 (4.8)	6.5 (4.8)	12/11 (4.8)	11 (4.8)	11 (4.8)	11 (4.8)	10 (4.8)
Nickel (Ni)	13 (4.8)	15 (4.8)	14 (4.8)	16 (4.8)	_15 (4.8)	14 (4.8)	14 (4.8)	12 (4.8)	13 (4.8)

c The identity or concentrations of these compounds cannot be conclusively determined and reporting limits have not been established.

NA Not analyzed

LT Less than

References: 1988 data - Weston 1991

μg/g Micrograms per gram

u Detection limit unavailable

⁽⁾ Detection limit

SOIL $(\mu g/g)$

Analytical Groups and Analytes Detected	SSHD-01 (1-3 ft) 1988	SSHD-01D (1-3 ft) 1988	SSHD-02 (1-3 ft) 1988	SSHD-03 (1-3 ft) 1988	SSHD-04 (1-3 ft) 1988	SSHD-05 (1-3 ft) 1988	SSHD-06 (1-3 ft) 1988	SSHD-07 (1-3 ft) 1988	SSHD-08 (1-3 ft) 1988
Metals Cont'd:									
Silver (Ag)	LT (0.65)	LT (0.65)	LT (0.65)	LT (0.65)	LT (0.65)	LT (0.65)	LT (0.65)	LT (0.65)	LT (0.65)
Sodium (Na)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium (Tl)	LT (7.9)	LT (4.9)	LT (7.9)						
Zinc (Zn)	LT (52)	73 (52)	62 (52)	LT (52)					
Anions:	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride (Cl)									
Fluoride (F)									
Sulfate (SO ₄)									
Nitrite (NO ₂)									
Nitrate (NO ₃)									
Radionuclides (pCi/g):									
Gross alpha (ALPHAG)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)
Gross beta (BETAG)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)
Uranium - Total	NA	NA	NA	NA	NA	NA	NA_	NA	NA

References:

1988 data - Weston 1991

NA Not analyzed

LT Less than pCi/g picocurie per gram

Detection limit for radionuclides varies for each sample

Detection limit () microgram per gram

SOIL (µg/g)

Analytical Groups and Analytes Detected	SSHD-09 (1-3 ft) 1988	SSHD-10 (1-3 ft) 1988	SSHD-11 (1-3 ft) 1988	SDHD-01 (1-1.5 ft) 1988	SDHD-02 (1-1.5 ft) 1988	SDHD-03 (1-1.5 ft) 1988
Semivolatile Organics:	NA	NA	NA	NA	NA	NA
Bis (2-ethylhexyl) phthalate (B2EHP)						
Benzyl alcohol (BZALC)						
Butylbenzyl phthalate (BBZP)						
Unknowns ^c						
Agent Breakdown Products:						
Isopropylmethyl phosphonic acid (IMPA)	NA.	NA	NA	NA	NA	NA
Metals:						
Arsenic (As)	LT (5.7)	LT (5.7)	LT (5.7)	LT (5.7)	LT (5.7)	LT (5.7)
Barium (Ba)	LT (u)	LT (u)	LT (u)	LT (u)	LT (u)	LT (u)
Beryllium (Be)	0.30 (0.33)	LT (0.33)	LT (0.33)	LT (0.33)	0.30 (0.33)	LT (0.33)
Cadmium (Cd)	1.1 (0.70)	LT (0.70)	LT (0.70)	LT (0.70)	LT (u)	1.5 (0.70)
Chromium (Cr)	180 (2.5)	180 (2.5)	120 (2.5)	170 (2.5)	290 (2.5)	180 (2.5)
Copper (Cu)	110 (3.8)	100 (3.8)	56 (3.8)	75 (3.8)	110 (3.8)	94 (3.8)
Lead (Pb)	12 (4.8)	8.3 (4.8)	7.5 (4.8)	6.9 (4.8)	9.0 (4.8)	9.4 (4.8)
Nickel (Ni)	13 (4.8)	14 (4.8)	11 (4.8)	11 (4.8)	13 (4.8)	13 (4.8)

c The identity or concentrations of these compounds cannot be conclusively determined and reporting limits have not been established.

NA Not analyzed

µg/g microgram per gram

Less than

u

() Detection limit

References: 1988 data - Weston 1991

Detection limit unavailable

SOIL $(\mu g/g)$

Analytical Groups and Analytes Detected	SSHD-09 (1-3 ft) 1988	SSHD-10 (1-3 ft) 1988	SSHD-11 (1-3 ft) 1988	SDHD-01 (1-1.5 ft) 1988	SDHD-02 (1-1.5 ft) 1988	SDHD-03 (1-1.5 ft) 1988
Metals Cont'd:						
Silver (Ag)	LT (0.65)	2.5 (0.65)	LT (0.65)	LT (0.65)	LT (0.65)	LT (0.65)
Sodium (Na)	NA	NA	NA	NA	NA	NA
Thallium (TI)	LT (7.9)	LT (7.9)	LT (7.9)	LT (7.9)	LT (7.9)	LT (7.9)
Zinc (Zn)	LT (52)	LT (52)	LT (52)	LT (52)	LT (52)	LT (52)
Anions:	NA	NA	NA	NA	NA	NA
Chloride (C1)						
Fluoride (F)						
Sulfate (SO ₄)						
Nitrite (NO ₂)						
Nitrate (NO ₃)						
Radionuclides (pCi/g):						
Gross alpha (ALHAG)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)
Gross beta (BETAG)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)	LT (v)
Uranium - Total	NA	NA	NA	NA	NA	NA

NA Not analyzed

LT Less than

pCi/g picocurie per gram

Detection limit for radionuclides varies for each sample

() Detection limit μg/g microgram per gram

References: 1988 data - Weston 1991

GROUNDWATER (µg/I)

Analytical Groups and		S-10	
Analytes Detected	1982	1987	1988
Semivolatile Organics:			
Bis (2-ethylhexyl) phthalate (B2EHP)	NA	3.0 (3.0)	LT (10)
Benzyl alcohol (BZALC)	NA	5.0 (u)	LT (10)
Butylbenzyl phthalate (BBZP)	NA	2.0° (3.0)	LT (10)
Unknowns ^c			380
Agent Breakdown Products:	NA		
Isopropylmethyl phosphonic acid (IMPA)		NA	3,700 (470)
Metals:			
Arsenic (As)	LT (4.0)	34 (2.5)	5.5/6.2 (5.0)
Barium (Ba)	NA	GT 200 (3.4)	NA
Beryllium (Be)	LT (0.40)	1.8 (0.83)	LT (0.10)
Cadmium (Cd)	LT (u)	LT (12)	LT (5.1)
Chromium (Cr)	LT (20)	88 (11)	LT (38)
Copper (Cu)	LT (6.0)	80 (21)	LT (1.8)
Lead (Pb)	LT (30)	20 (1.5)	LT (2.5)
Nickel (Ni)	LT (4.0)	82 (65)	13/18 (9.6)

- a Probably due to laboratory contamination
- The identity or concentrations of these compounds cannot be conclusively determined and reporting limits have not been established.
- NA Not analyzed

GT Greater than LT Less than

Less than
Detection limit unavailable

() Detection limit

μg/l microgram per liter

References: 1982 data - Ertec 1982

1987 data - EA Engineering 1988

1988 data - Weston 1991

Ċħ

GROUNDWATER (µg/l)

Analytical Groups and Analytes Detected	1982	S-10 1987	1988
Metals Cont'd:			
Silver (Ag)	LT (8.0)	0.47 (0.14)	LT (0.20)
Sodium (Na)	31,000 (1000)	28,000 (450)	NA
Thallium (Tl)	NA	4.7 (1.7)	LT (5.0)
Zinc (Zn)	15 (3.0)	270 (14)	28/370 (17)
Anions:			
Chloride (Cl)	13000 (100)	23,000 (5000)	LT (130,000)
Fluoride (F)	LT (1000)	600 (360)	LT (5)
Sulfate (SO ₄)	GT 19,000 (1000)	40,000 (4730)	LT (130,000)
Nitrite (NO ₂)	LT (900)		
Nitrate (NO ₃)	8100 (1000)		
Nitrate-nonspecific (NIT)		8000 (+24)	LT (5000)
Radionuclides (pCi/l):			
Gross alpha (ALPHAG)	LT (3.0)	$11 \pm 6.0 (u)$	LT 2.7 (v)
Gross beta (BETAG)	LT (6.0)	$17 \pm 6.0 (u)$	$2.9 \pm 1.7 (v)$
Uranium - Total	NA	NA	LT 0.30 (v)

NA Not analyzed

GT Greater than

LT Less than

pCi/l picocurie per liter

u Detection limit unavailable

v Detection limit for radionuclides varies for each sample

() Detection limit μg/l microgram per liter

References: 1982 data - Ertec 1982

1987 data - EA Engineering 1988

1988 data - Weston 1991

SOIL (µg/g)

Analytical Group and Analytes Detected	S-SS-10-BK ¹
Metals:	
Arsenic (As)	19
Beryllium (Be)	0.36
Chromium (Cr)	19
Copper (Cu)	23*
Lead (Pb)	14
Silver (Ag)	0.13
Sodium (Na)	1800
Zinc (Zn)	63

1

Metals analysis only Detected in associated method blank

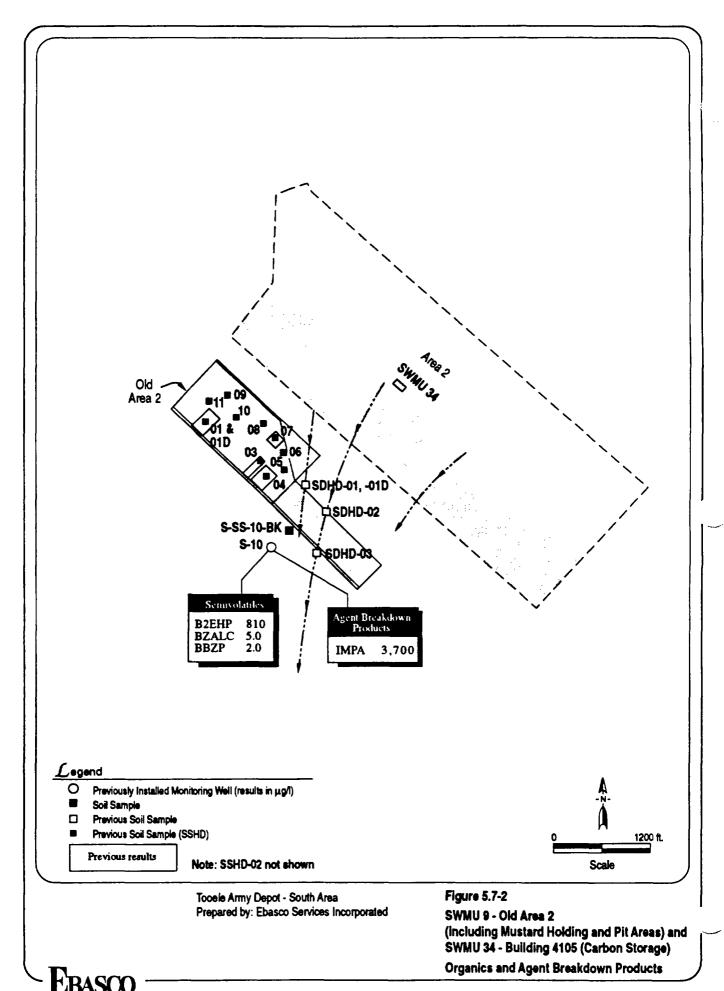
μg/g Microgram per gram

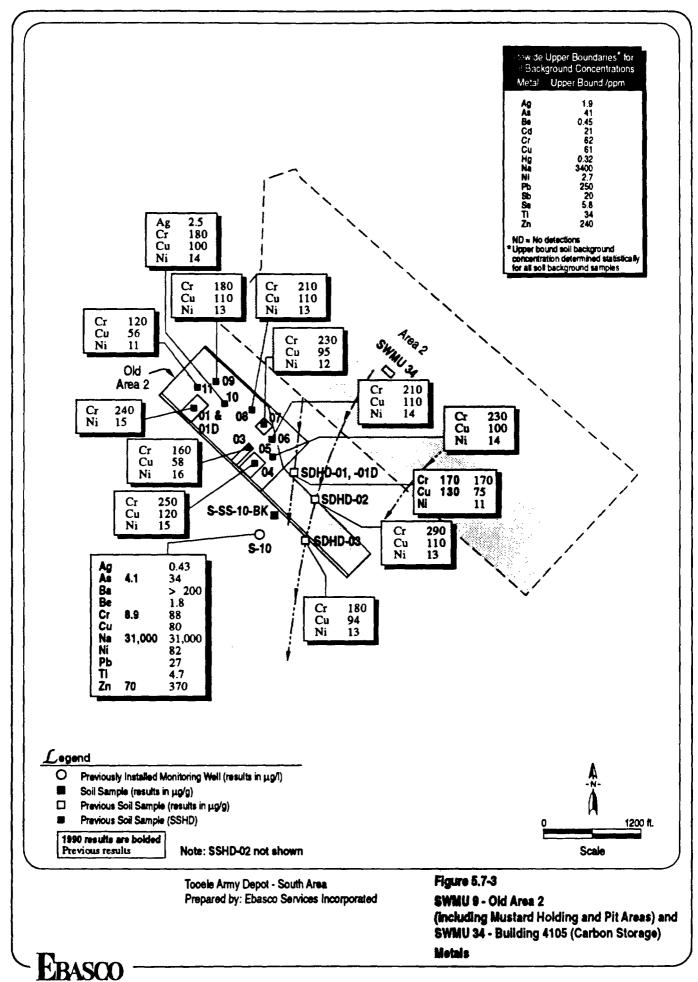
GROUNDWATER (µg/I)

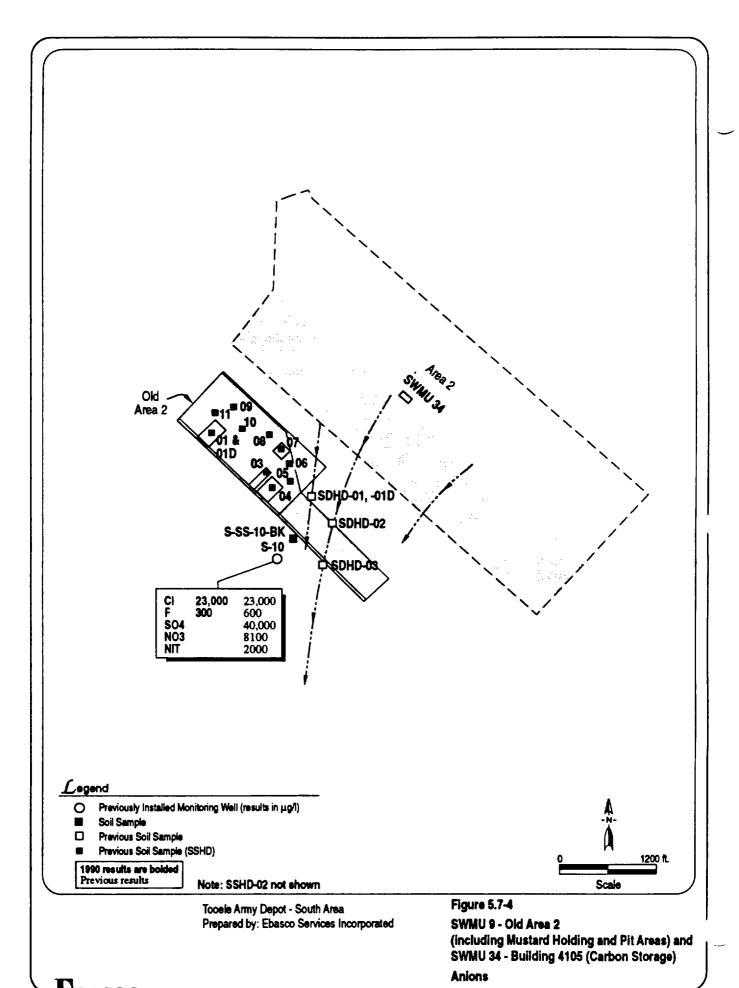
Anlytical Group and Analytes Detected	S-10
Metals:	
Arsenic (As)	4.1
Chromium (Cr)	8.9
Sodium (Na)	31,000
Zinc (Zn)	70
Anions:	
Chloride (CI)	23,000
Fluoride (F)	300
Radionuclides (pCi/l):	
Gross alpha (ALPHAG)	49*
Uranium (U)	9.1*

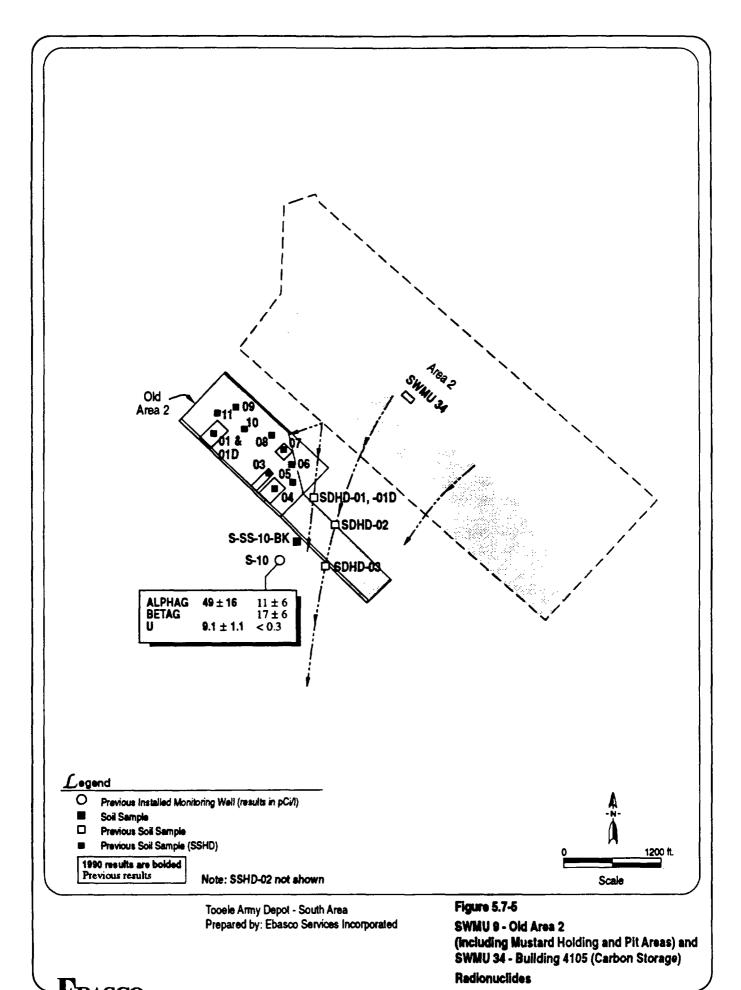
Detected in associated method blank

pCi/l Picocurri per liter µg/l Microgram per liter









5.7.5 Recommendations

Since soil contamination has been found in Old Area 2, and since open storage of agent-filled containers occurred in the south part of Area 2, one upgradient and two additional downgradient wells are proposed. These wells should be analyzed for semivolatile organics, agent breakdown products, and metals. In addition, well S-10 should be resampled for analysis of agent breakdown products and metals. The semivolatile organics analysis should also be repeated to confirm or refute the relatively high level of phthalates detected in the RFI-Phase I. Slug tests should also be performed in the new wells to determine the aquifer characteristics.

Additional soil sampling is recommended at Old Area 2 to delineate the lateral and vertical extent of metal contamination. Twelve borings are proposed in this area as shown in Figure 5.7-6. Six borings should be drilled inside Old Area 2 to delineate the vertical extent of previously detected metal contamination, and six should be drilled around the outside of this area for defining lateral and vertical extent. Each boring should be sampled from 0- to 6-inch and 6- to 12-inch, 2- to 3-ft, and 4- to 5-ft intervals and analyzed for metals.

Four test pits should be excavated in the burning area to the east of Old Area 2. A total of 16 samples should be collected with at least one soil sample per pit located according to evidence of contamination. These samples should be analyzed for organics, explosives, agent breakdown products, and metals.

Previous sediment samples from the drainage ditches east of this area were collected from 1 to 1.5 ft since explosives are expected to degrade near the surface. Therefore, samples from the 0- to 6-inch interval should be collected and analyzed for metals at the same approximate locations as previously sampled, in addition to five additional locations to investigate possible metal contamination transport in the creek bedload.

Soil sampling is also recommended in the open part of Area 2, southwest of the ammunition storage buildings, to detect any releases of agent breakdown products or metals. Soil should be sampled at the five locations shown in Figure 5.7-6. At each proposed location, samples should be collected from 0- to 6-inch and 6- to 12-inch, 2- to 3-ft, and 4- to 5-ft intervals. The samples should be analyzed for agent breakdown products and metals. A representative number of samples from each of the above areas should be analyzed for pH, total organic carbon, and electrical conductance.

To support an ecological assessment of SWMU 9, biota data may be needed. A vegetation survey should be conducted to identify habitats in and near SWMU 9, and threatened and endangered species should be identified in consultation with the U.S. Fish and Wildlife Service. Game species that could be consumed by humans should also be identified.

An explosive risk determination will be conducted at this SWMU and if soil sampling results indicate contamination, biota sampling should be considered.

